Homework 5

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1 Problem Set 1

Consider the unsolvable system Ax = b as given below:

$$\begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 1 & 3 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 8 \\ 8 \\ 20 \end{bmatrix}$$

1.1 Write R Markdown script to compute A^TA and A^Tb

```
A <- matrix(c(1,1,1,1,0,1,3,4), ncol = 2)
b <- matrix(c(0,8,8,20))

ATA <- t(A) %*% A
ATb <- t(A) %*% b
```

1.2 Solve for $\hat{x}$ in R using the above computed matrices

```
x <- solve(ATA) %*% ATb
x
```

```
##      [,1]
## [1,]    1
## [2,]    4
```

1.3 What is the squared error of this solution?

```
p <- A %*% x
```

1.4 Find the exact solution with p instead of b